

Note: This plan is a draft; the project goals and objects have not changed, but some of the
Stocking Logistics may have changed October 24, 2000

Assessment Plan for Net-pen Reared River Specific Releases; Stock Supplementation and Spawning Ground Movements

Working Draft Plan August 11, 2000

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Project Goal:

The goal of this study is to evaluate the feasibility of using net-pen reared adult Atlantic salmon of river-specific origin to supplement the natural production on the Dennys, Machias and St. Croix Rivers.

Specific Objectives:

1. **Spawning Ground Movements** - Compare riverine movements between netpen-reared adults and previously collected data from freshwater reared adults (captive broodstock released in previous years) using ultrasonic telemetry.
2. **Spawning Characteristics** Evaluate the spawning characteristics (site selection and timing) of netpen-reared adults within the riverine environment as compared to the spawning characteristics of naturally reared wild Atlantic salmon.
3. **Habitat Selection** - Assess spawning habitat selection by marine netpen-reared adults, for comparison with existing literature on wild stocks.
4. **Post-Spawning Disposition** Assess over winter disposition (immediate out migrants, kelts, or presumed deceased) through the use of ultrasonic telemetry and/or adult trapping facilities.
5. **Population Contributions** Monitor the stage-specific (fry to spawning escapement) Atlantic salmon production attributable to natural reproduction by netpen-reared adult Atlantic salmon.
6. **Emergence Estimates** - Estimate fry emergence rates for eggs deposited in redds dug by netpen-reared Atlantic salmon.
7. **Survival Estimates** - Develop stage-specific survival estimates (fry to spawning escapement) within a control site.
8. **Reproductive Fitness** Evaluate the reproductive success of progeny originating from netpen-reared Atlantic salmon.

Table 1: Drainage involvement in specific objectives.

Objectives	<u>Drainage</u>		
	Dennys	Machias	St. Croix
1. Spawning Ground Movements	X		
2. Spawning Characteristics	X	X	X
3. Habitat Selection	X	X	X
4. Post-Spawning Disposition	X		X
5. Population Contributions	X	X	X
6. Emergence Estimates	X		X
7. Survival Estimates	X		
8. Reproductive Fitness	X	X	X

Period:

September 2000 - October 2005

Project Cooperators:

Atlantic Salmon of Maine (ASOM), Connors Brothers Aquaculture, Inc. (CBA), Stolt Sea Farm, Inc. (SSF), Maine Atlantic Salmon Commission (ASC), Northeast Fisheries Science Center (NEFSC), St. Croix International Waterway Commission (SCIWC), and US Fish & Wildlife Service (USF&WS).

Background:

In February 1997, approximately 60,000 eyed eggs from river-specific broodstock of the Dennys (20,000), Machias (20,000), and East Machias (20,000) Rivers were transferred from Craig Brook National Fish Hatchery to private aquaculture facilities for rearing. Eggs from the Machias River were reared at the Oquossoc Hatchery in Rangely, Maine, while those from the Dennys and East Machias Rivers were reared at the Solon Hatchery in Skowhegan, Maine. A Memorandum of Understanding signed by the U.S. Fish & Wildlife Service, State of Maine natural resource agencies, and Atlantic Salmon of Maine, outlined the transfer of these eggs and described the need for an evaluation of this trial program. These investigations are the final component to the ongoing efforts to evaluate this program and are designed to determine the contributions these adults will make to the future spawning stocks.

The transfer of eggs from the federal hatchery system to private aquaculture is part of Maine's Atlantic Salmon Conservation Plan. The purpose of this joint venture is to involve the aquaculture industry in the rehabilitation of native stocks using their facilities and expertise. The planned products of these transfers are 1) juvenile fish and 2) mature Atlantic salmon.

Juvenile Atlantic salmon were stocked out as advanced parr or smolts (age 1+). Approximately 34,000 smolt/parr were released into their respective rivers during the spring of 1998 (Dennys River (9,800), Machias River (10,900), and East Machias (14,100)). In addition, approximately 2,000 smolts from each stock were divided into two lots and transferred to separate marine netpen facilities at Cross Island, Machias Bay (ASOM) and Deep Cove, Cobscook Bay during May 1998. All of these, approximately 6,000 smolts, were triple marked: adipose fin clip, and a colored Visual Implant Elastomer (VIE) tag applied to both the right adipose eye tissue and the right lower jaw. Each river has been designated with a uniquely colored VIE tag (Dennys - orange, East Machias - yellow, and Machias - red) to aid in future stock differentiation.

These netpen reared individuals will have experienced two full sea winters and will be approaching the spawning age typical of Maine Atlantic salmon during the fall of 2000. At this point, they offer a unique management opportunity whereby for the first time in the United States, mature marine-reared Atlantic salmon adults can be stocked into their natal rivers. ***The tentative plan is to release enough Machias and Dennys origin mature adults into their natal drainages to respectively achieve 50% and 100% of the minimum egg deposition rates during***

fall of 2000. The numbers stocked will be calibrated using fecundity estimates for siblings of these fish being raised in Cobscook Bay and from fish being reared at Cross Island who will be sacrificed for disease screening. These data will be collected during the summer 2000 and will be available during September 2000.

Approximately 600 to 900 of these river specific netpen-reared individuals will also be stocked into the St. Croix River. These individuals will be stocked in conjunction with progeny of natural adult returns to the St. Croix River. These St. Croix River fish were reared in a Canadian river-specific stock development program by the Canada Department of Fisheries & Oceans and SCIWC, and transferred in May 1998 to an isolated ASOM marine netpen at Flint Island, Narraguagus Bay, for rearing to two-sea-winter adults. In July 2000, 49 out of 121 adult salmon were sacrificed for disease screening and the remaining 72 fish are available for inclusion in this research program.

Stocking Logistics:

Cross Island facility

- I.** Sex and maturity status for all individuals will be determined by ultrasound
 - a.** Only individuals determined to be sexually mature during 2000 will be available for stocking
- II.** Isolate required number of maturing individuals for Downeast stocking - 50:50 sex ratio will be approximated (see **Table 2**) (August 21-22, 2000)
 - a.** Approximate numbers depending on fecundity estimates and logistic concerns (see **Table 2**):
 - i.** Dennys = xxx + 16 (see **Table 3**) individuals
 - ii.** Machias = xxx +16 (see **Table 4**) individuals
 - iii.** East Machias = 16 (see **Table 5**) individuals
 - b.** Sex, maturity status, length, weight, and genetic samples will be taken/recorded for all selected individuals
 - c.** All selected individuals will also receive a passive induced transponder tag (PIT tag) for individual identification
- III.** Isolate required number of maturing individuals for St. Croix stocking - 50:50 sex ratio will be approximated (August 21-22, 2000)
 - a.** Approximate numbers based on stocking logistics feasibility
 - i.** Approximately 600 - 900 individuals (see **Table 6**) individuals
 - b.** Sex, maturity status, length, weight, and genetic samples will be taken/recorded for all selected individuals
 - c.** All selected individuals will also receive a passive induced transponder tag (PIT tag) for individual identification

Table 2: Adults needed to achieve 100% and 50% of the Minimum Conservation Spawning Requirement for the Dennys and Machias Rivers respectively, based on an egg deposition target of 240 eggs per m² of available habitat and for a range of potential fecundity values. Male:Female ratio of 1:1 is assumed.

Fecundity Assumptions (eggs/female)	Approx # needed Dennys	Approx # needed - Machias
8,500	134	174
8,000	142	185
7,500	152	197
7,200*	158	205
7,000	163	211
6,500	175	227
6,000	190	246
5,500	207	269
5,000	228	295

* *Literature value for Atlantic salmon sea run female fecundity*

IV. Transfer selected individuals to University of Maine s Franklin facility by truck (Tentatively scheduled for the last week in September or first week in October 2000)

a. All Downeast destined individuals will be held in a single tank

b. All St. Croix destined individual will be held in a single tank

i. 72 St Croix river-specifics will be added to this tank

Note: These fish will be sampled according to above protocols and transport to the Franklin facility will be coordinated separately)

V. Harvest remaining non-maturing individuals at ASOM s convenience

University of Maine Franklin facility

VI. Individuals will be held in isolation at the Franklin facility

VII. Prior to stocking, a V16 ultrasonic tag will be inserted into a sub-sample of the Downeast destined adults according to **Table 7**.

a. These ultrasonically tagged individuals will be held in a separate, smaller tank

VIII. Transfer Dennys individuals to specific stocking sites according to **Tables 3 and 7** (Tentatively scheduled for the week of October 15, 2000)

a. Stowaway temperature monitors will be deployed at all stock out locations

IX. Transfer Machias individuals to specific stocking sites according to **Table 4** (Tentatively scheduled for the week of October 15, 2000)

IX. Transfer St. Croix and remaining Downeast individuals to specific St. Croix stocking sites based upon to **Table 6** (Tentatively scheduled for the week of October 15, 2000)

Table 3. Dennys River stock out sites, accessible habitat, and numbers for marine netpen-reared adult stocking.

Stock out site	Branch	Adjacent Accessible Habitat	Habitat Units (100 m²)	# of Females/ Males	Female 20% Buffer	Male 30% Buffer	Total Number
Gilman Schoolbus	Mainstem	Gillman Riffles, Meddybemps Riffles	76.5	3/3	1	1	8
Gardner Landing	Mainstem	Garner Rips, Bright Island Rips	256.9	9/9	2	3	23
Gardner Landing	Mainstem			6/6			12
Curry Landing	Mainstem	Clark Rips, Ayers Rips, Stoddards Rips, Little Falls	533.7	18/18	4	5	45
Robinson s Camp	Mainstem	Camp Rips, Mill Seat, and Uptown Rips	572.8	19/19	4	6	48
Club House Landing	Mainstem/ Cathance	Downtown Rips, Cathance Lowest Rips	375.6	13/13	3	4	33
Club House Landing	Mainstem/ Cathance			5/5			10
Nowhere Rips	Cathance	Nowhere Rips	242.1	8/8	2	2	20
Subtotal				81/81	16	21	199
Below Adult Weir	Estuarine			8/8	-	-	16
Total				89/89	16	21	215

Assuming a fecundity rate of 7,200 eggs per female and an egg deposition rate of 240 eggs per 100 m² of available juvenile habitat

Table 4. Machias River stock out sites, accessible habitat, and numbers for marine netpen-reared adult stocking.

Stock out site	Branch	Adjacent Accessible Habitat	Habitat Units (100 m²)	# of Females/ Males	Female 20% Buffer	Male 30% Buffer	Total Number
Crooked River 52-00-00 rd	Crooked River	52 Riffles Lower	80.5	3/3	1	1	8
Crooked River Confluence at camp	Mainstem	Lower Half W. Branch Rips, Boot Rips	824.5	27/27	5	8	67
Rt 9 Campsite	Mainstem	Route 9 Rips	275.5	9/9	2	3	23
W. Branch Campsite	Mainstem	Carrick Rips, Upper Half W. Branch Rips	366.1	12/12	2	4	30
Wigwams	Mainstem	Wigwams Lower	588.6	20/20	4	6	50
Outlet of Third Lake	Third Lake Stream	Third Lake Stream	401.5	13/13	3	4	33
<i>*Below Rt 9</i>	Mopang	T30 Rips	111.7	4/4	1	1	10
<i>*Camp Chomp Chomp</i>	Mopang	Horse Rips	281.9	9/9	2	3	23
W.Branch Aquaboggan	West Branch	Aquaboggan Rips Lower	276.0	9/9	2	3	23
Subtotal				106/106	22	33	267
Behind Machias Irving	Estuarine			8/8	-	-	16
Total				114/114	22	33	283

Assuming a fecundity rate of 7,200 eggs per female and an egg deposition rate of 240 eggs per 100 m² of available juvenile habitat

Stocking allocation was based on seeding 50% of the habitat versus stocking 50% of the required adults into the drainage

* Need to verify these sites

Table 5. East Machias River stock out site and number for marine netpen-reared adult stocking.

Stock out site	Branch	Adjacent Accessible Habitat	Habitat Units (100 m²)	# of Females/ Males	Female 20% Buffer	Male 30% Buffer	Total Number
Rim Road	Estuarine			8/8	-	-	16
			Total	8/8	-	-	16

Table 6. St Croix River stock out sites, accessible habitat, and numbers for marine netpen-reared adult stocking.

Stock out site	Branch	Adjacent Accessible Habitat	Habitat Units (100 m²)	# of Females/ Males	Female 20% Buffer	Male 30% Buffer	Total Number	Stock
*Wingdam	Mainstem	Back Wingdam, Wingdam, Elbow, Picnic Ground Rips	582	12/12	2	4	30	EM
***Little Falls	Mainstem	Little Falls Area, Halls Rips, Pork Rips	1855	62/62	12	19	155	DE
Scott Brook	Mainstem	Pork, Tyler, Cedar Island, Albee Rips	1321	44/44	9	13	110	MC
**Rocky Rips	Mainstem	Rocky Rips	434	14/14	3	4	30	SC
Gravel Island	Mainstem	Rocky, Split Rock Rips	519	17/17	3	5	42	SC
Meeting House Rips	Mainstem	Meetinghouse Rips	1030	34/34	7	10	86	EM
Loon Bay	Mainstem	Grassy island Area, Haycock Rips	237	13/13	3	4	33	EM
*Canoose	Mainstem	Canoose Rips and Stream	348	4/4	1	1	10	EM
*Wapsaconhagen	Mainstem	Wapsaconhagen, River Mainstem	243	6/6	1	2	15	EM
			Total	207/207	41	62	510	

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Assuming a fecundity rate of 7,200 eggs per female and an egg deposition rate of 240 eggs per 100 m² of available juvenile habitat

* Allocation based on other factors other than juvenile habitat units (i.e. limited spawning habitat)

** Limited by fish shortage

*** Use all available Dennys strain

Table 7. Location, approximate number (depending on fecundity estimates, sex ration of 1:1 is implied) number, and number of ultrasonically tagged (gastric insertion) adults to be release in the Dennys, Machias, and East Machias drainages.

Stock	Stock out site	Number Stocked	Number with Pingers	Percent tagged
Dennys	Gilman Schoolbus	8	2	25%
Dennys	Gardner Landing	35	10	29%
Dennys	Curry Landing	45	14	31%
Dennys	Robinson s Camps	48	14	29%
Dennys	Clubhouse Landing	43	12	28%
Dennys	*Nowhere Rips	20	0	-
**Dennys	Below Adult Weir	16	16	100%
**Machias	Machias Irving Station	16	16	100%
**East Machias	Rim Road	16	16	100%
Total			100	

* No fish stocked at Nowhere Rips are to receive pingers. These fish are to be used as a control site to estimate stage-specific survivals.

** Stock out numbers are based on number of individuals, not fecundity estimates. These sites will be used to evaluate the lower river movement patterns of these marine reared adults (see Lower River Movements -2000 Net-pen Release Draft Assessment Plan.doc). The Dennys release will also test the effectiveness of the adult trapping facility.

Assessment Logistics:

Objective 1: Spawning Ground Movements Compare riverine movements between netpen-reared adults and previously collected data from freshwater reared adults (captive broodstock released in previous years) using ultrasonic telemetry.

University of Maine Franklin facility:

I. During biological sampling (see Stocking Logistic, Part VI), 68 Dennys River females will have a V16 ultrasonic pinger manually inserted into the gastric cavity (Tentatively schedule for the week of October 9, 2000)

Dennys River:

II. 16 Automatic Pinger Detection Units (APDU) will be deployed throughout the Dennys River following the location assignments in **Table 8**. (Tentatively scheduled for the week of October 9, 2000)

Table 8. Deployment locations for 16 APDU throughout the Mainstem of the Dennys River

	Unit name	Alt name
1.	Upper Meddybemps	UM
2.	Above Gilman Riffles	AG
3.	Gardner Rips	GR
4.	Upper Clark	UC
5.	Curry Landing	US
6.	Little Falls	LF
7.	Upper Camp	CA
8.	Upper Narrow	UN
9.	USGS Gauge	UG
10.	Cathance Confluence	CC
11.	Lower Marion Falls	LM
12.	Lower Cathance	LC
13.	Clubhouse	CH
14.	Below Weir	BW
15.	Upper Estuary	UE
16.	Clark Point	CP

III. Ultrasonically tagged Dennys adults will be released at the specified locations according to **Table 7**. (Tentatively scheduled for the week of October 15, 2000).

IV. All freshwater APDU will be retrieved and downloaded 6 weeks post deployment.

(Tentatively scheduled for the week of November 26, 2000).

- a. Three APDU will be redeployed and swapped out with the three lower river units. This process will continue through the winter and into the spring to monitor post-spawning out-migration.

Objective 2: Spawning Characteristics Evaluate the spawning characteristics (site selection and timing) of netpen-reared adults within the riverine environment as compared to the spawning characteristics of naturally reared wild Atlantic salmon

- I. Complete redd survey on the Dennys River will be conducted through the Fall 2000
 - a. A correctable Global Positioning System (GPS) receiver will be used to obtain precise coordinates of all redds counted within the drainage
 - b. Ultrasonic telemetry and Adult weir data will be used to help designate surveyed redds as wild or netpen-reared origin.
- II. Standard redd survey on the Machias River will be conducted through the Fall 2000
 - a. A correctable Global Positioning System (GPS) receiver will be used to obtain precise coordinates of all redds counted within the drainage
 - b. Dennys River estimates of redds/netpen-reared female will be used to partition all surveyed redds within the Machias River into being of wild or netpen-reared origin.
- III. Standard redd survey on the St. Croix River will be conducted through the Fall 2000
 - a. A correctable Global Positioning System (GPS) receiver will be used to obtain precise coordinates of all redds counted within the drainage.

Objective 3: Habitat Selection - Assess spawning habitat selection by marine netpen-reared adults, for comparison with existing literature on wild stocks.

- I. Habitat selection for redd locations will be evaluated by correlating redd GPS locations, field notes, and Dennys, Machias, or St Croix habitat survey data

Objective 4: Post-Spawning Disposition Assess over winter disposition (immediate out migrants, kelts, or presumed deceased) through the use of ultrasonic telemetry and/or adult trapping facilities

Dennys River:

- II. In conjunction with the **Objective 1: Spawning Ground Movements**, a series of Automatic Pinger Detection Units will be deployed throughout the Dennys River, including the estuarine environment. These units will be used to assess the within river movements of any ultrasonically tagged netpen-reared individuals. The lowest three units of this array will be maintained over winter and through the spring of 2001. The data collected by these units will enable us to determine which individuals are emigrating from the system post spawning versus any individuals exiting the system as a spring run kelts. The balance of the undetected tagged individuals will be assumed deceased.

St Croix:

III. The St. Croix International Waterway Commission maintains a fish lift facility on the St. Croix River that has the ability to capture upstream and downstream migrants. This facility will be utilized to monitor and assess the timing of all out migrating adult Atlantic salmon in an effort to quantify the post-spawning disposition of the stocked individuals. PIT tags will allow St. Croix International Waterway Commission staff to identify out-migrating adult individuals.

Objective 5: Population Contributions Monitor the stage-specific (fry to spawning escapement) Atlantic salmon production attributable to natural reproduction by netpen-reared adult Atlantic salmon.

Dennys, Machias and St. Croix Rivers:

- I.** Electrofishing surveys (July - September, 2001 - 2003)
 - a.** Standard index locations
 - i.** Genetic samples will be taken on a subset (n=xx) of captured individuals to enable the partitioning of the stocked individual s contribution to the juvenile standing crop
- II.** Smolt out-migration monitoring (April - June, 2002 - 2004)
 - a.** Standard smolt trapping on Dennys, Machias and St. Croix Rivers
 - i.** Genetic samples will be taken on a subset of captured individuals to enable the partitioning of the stocked individual s contribution to the smolt abundance
- III.** Adult returns monitoring (April - October, 2003 - 2005)
 - a.** Standard adult return monitoring on Dennys River
 - b.** Standard adult return monitoring on Machias River (*contingent on the construction of an adult trapping facility*)
 - c.** Standard adult return monitoring on St. Croix River
 - d.** Scale and genetic samples will be taken from **all** returning adults (> *stocking year* + 3) to enable partitioning absolute contribution to adult escapement by stocked individuals.

Objective 6: Emergence Estimates - Estimate fry emergence rates for eggs deposited in redds dug by netpen-reared Atlantic salmon.

Dennys and St Croix Rivers:

- I.** Individual redds will be identified post redd surveying as candidates for emergence work.
 - a.** Ultrasonic telemetry and adult weir data will be used to positively identify redds constructed by netpen reared adults
 - b.** These redds will be flagged with brightly colored mushroom anchors to aid in locating them during the Spring 2001.

- c. Tidbit temperature monitors (□Onset Corp) will be deployed at each site
 - i. River temperatures will need to be monitored to accurately estimate a time window when fry emergence will likely be commencing.
 - (a). Emergence traps will need to be deployed prior to the onset of this window.
- II. Emergence traps will be placed over 3-4 previously identified redds located within the Mainstem at 2 different locations (Total traps deployed = 6-8).
 - a. These traps will be used to evaluate emergence rates on redds constructed by marine netpen-reared stocked adults
 - i. Timing of emergence will be calculated based on daily mean temperature at each site as recorded by temperature loggers
 - ii. Traps will need to be tended on a daily basis during emergence
 - (a). Live fry will be released daily upon enumeration
 - (b). A sub-sample of fry will be collected for genetic analysis
 - iii. Emergence rates will be calculated from:
 - (a). Fecundity estimates from Cobscook Bay fish and the Cross Island sibling group
 - (b). Assumed egg deposition rates
 - (c). Calculate number of redds/female

Objective 7: Survival Estimates - Develop stage-specific survival estimates (fry to spawning escapement) within a control site.

Dennys River (Cathance Stream - Nowhere Rips):

- I. Picket weirs will be installed along the upper and lower reaches of Nowhere Rips (Cathance Stream) (Tentatively scheduled for the week of September 24, 2000) to prevent any immigration or emigration of adults into the control site
- II. A total of 16 individuals (*depending on fecundity estimate, 50:50 sex ratio approximated*) will be stocked (foot/ATV - cooler) into this section
 - a. Daily cleaning of the weirs will be necessary
 - b. A full survey will be conducted to count the number of redds and individuals within the section to verify the absence of natural spawners and to estimate the potential number of redds/spawners contributing
 - i. It may be necessary to Carlin tag prior to stocking to help with visual surveying of this section
- III. Complete electrofishing survey will be completed throughout this section to estimate juvenile standing crop resulting from the adult stocking (July - September, 2001 - 2003)
- IV. Smolt abundance will be estimated by genetic assignments of smolts captured at the smolt trap (April - June, 2002 - 2004)
- V. Spawning escapement will be estimated by genetic assignments of adults captured at adult weir (April - October, 2003 - 2005)

Objective 8: Reproductive Fitness Evaluate the reproductive success of progeny originating from netpen-reared Atlantic salmon.

I. Genetic samples collected from all returning adults (***Objective 4: Population Contributions***) will enable for the evaluation of the degree to which progeny from these adults contribute to the future spawning stock.

a. Genetic samples from returning adults will allow for the assignment of future out-migrating smolts and, consequently, the overall effect on the population's fitness caused by the marine netpen-reared adult stocking.

Table 9a: Project Timeline at a Glance:

2000 (b y qtrs.)				2001 (b y qtrs.)				2002 (b y qtrs.)				2003 (b y qtrs.)				2004 (b y qtrs.)				2005 (b y qtrs.)					
1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th		
																								Objectives:	
	X	X		X	X																			Objective 1	Spawning Ground Movements
	X	X																						Objective 2	Spawning Characteristics
	X	X																						Objective 3	Habitat Selection
		X		X	X																			Objective 4	Post-Spawning Disposition
						X		X	X			X	X	X					X	X				Objective 5	Population Contributions
		X		X																				Objective 6	Emergence Estimates
	X	X				X		X	X			X	X	X					X	X				Objective 7	Survival Estimates
												X	X					X	X					Objective 8	Reproductive Fitness
																									Logistics:
	X																								Final biological sample (Cross Island)
	X																								Transfer individuals to Franklin facility
		X																							Stocking of individuals

Table 9b: Activities at a Glance:

Objective:	Actions needed:
Objective 1 Spawning Ground Movements	Telemetry
Objective 2 Spawning Success	Redd counts
Objective 3 Habitat Selection	Telemetry and redd counts
Objective 4 Post-Spawning Disposition	Telemetry and adult trap monitoring
Objective 5 Population Contributions	Electrofishing, smolt monitoring, adult return monitoring
Objective 6 Emergence Estimates	Redd counts and emergence trap operation
Objective 7 Survival Estimates	Control Site setup, redd count, adult survey, electrofishing, smolt monitoring, adult return monitoring
Objective 8 Reproductive Fitness	Adult returning monitoring and smolt monitoring

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